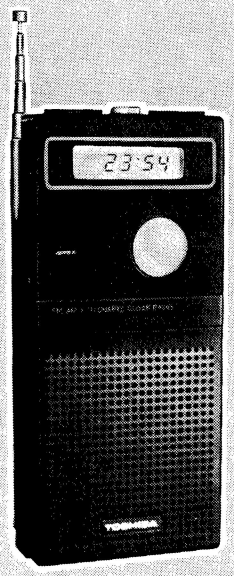
**SERVICE DATA**
**FILE NO. 150-128**

# TOSHIBA

## LCD QUARTZ CLOCK RADIO

# QR-2000




### SPECIFICATIONS

| | |
|---|---|
| **Radio Section:** | |
| Frequency Range: | FM 87.5 – 108 MHz<br>AM 525 – 1605 kHz |
| Power Output: | 200mW (at 10% distortion) |
| Speaker: | 50mm |
| Battery: | UM-3 ("AA" Dry Cell) x 2<br>DC3V |
| **Clock Section:** | |
| Display: | FE Type LCD |
| Accuracy: | ±15 Seconds Per Month<br>(at temperature 25°C<br>constant) |
| Quartz Frequency: | 32.768 kHz |
| Battery: | Silver Oxide Type<br>G-13 or S76 |
| Battery Life: | Approximately Two Years |
| **General:** | |
| Operating Temperature: | 0°C – 40°C |
| Semiconductors: | 1C-MOS LSI, 13<br>Transistors, 12 Diodes |
| Dimensions (W x H x D): | 65 x 137 x 21 (mm) |
| Weight: | 300 gr. |

# OPERATING CONTROLS

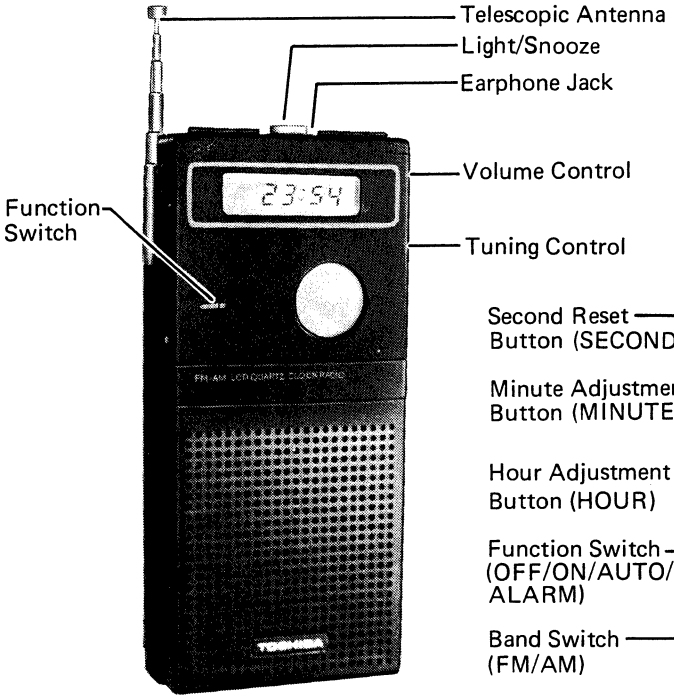



Figure 1.

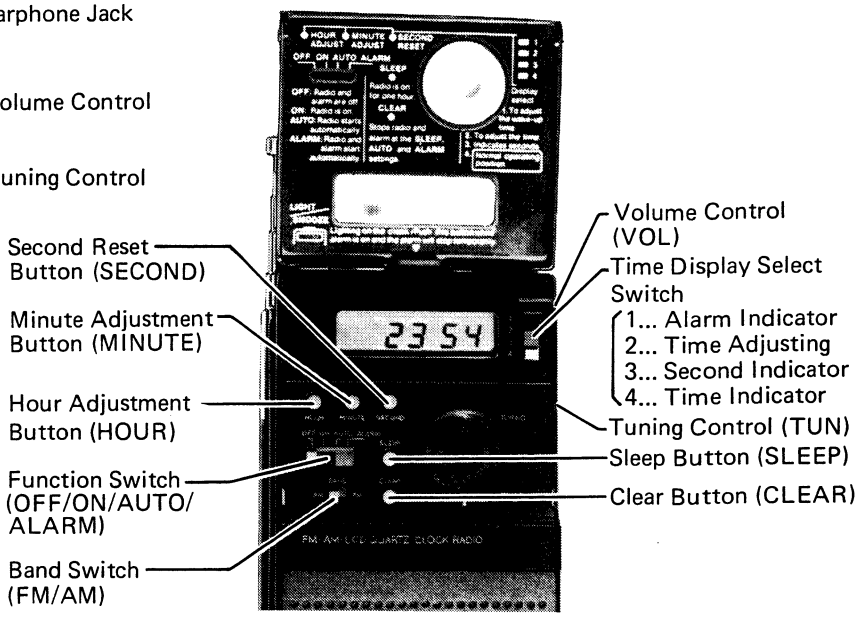



Figure 2.

# DISASSEMBLY INSTRUCTIONS

**BACK CABINET REMOVAL (Figure 3.)**

1. Remove 4 Screws, ① and ② .
2. Remove the battery cover for radio side.
3. Separate the cabinet back from the cabinet front.
   ① ..... Screw OVL 2$\phi$ x 16$^{mm}$ (BLK)
   ② ..... Screw OVL 2$\phi$ x 8$^{mm}$ (BLK)

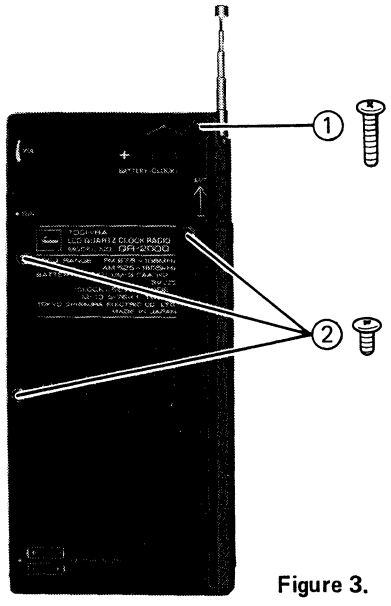



Figure 3.

**MAIN P.C. BOARD REMOVAL (Figure 4.)**

1. Unsolder five points in the main P.C. Board and speaker and battery lead wires.
2. Remove the Main P.C. Board from the cabinet upward.

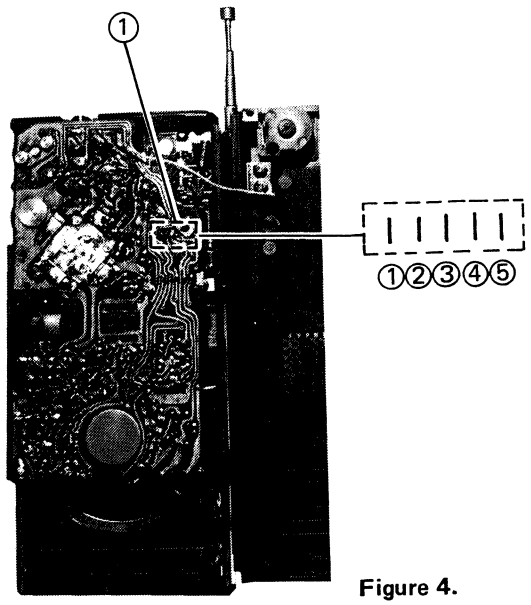



Figure 4.

### CLOCK P.C. BOARD REMOVAL (Figure 5.)

1. Remove a screw ① and a stud ② .
   1 ..... Screw BID 2ϕ x 3 (BLK)
2. Separate the CLOCK P.C. Board from the cabinet front.

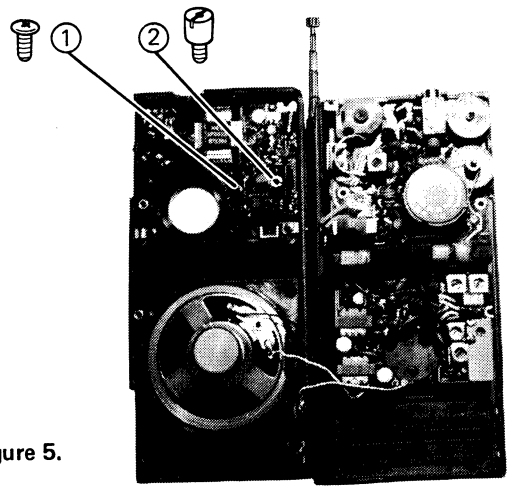



Figure 5.

## DIAL CORD RESTRINGING

### GENERAL

1. Remove the Dial plate.
2. Set the variable capacitor to the minimum capacitance (Plates fully open).
3. Tie the spring and dial cord as shown in the illustration.
4. Insert the dial cord through the dial pulley eye, and wind the cord as shown in the illustration.
5. Hook the spring on the drum.

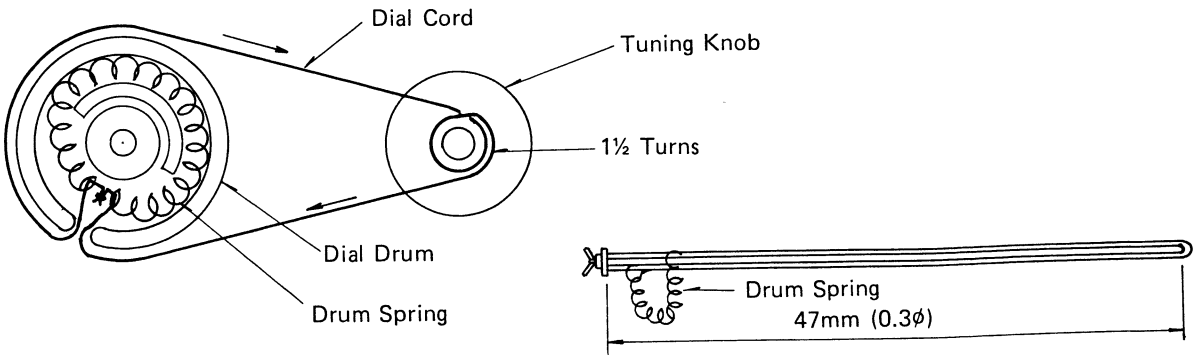



Figure 6.

## CLOCK ALIGNMENT

### CLOCK ALIGNMENT

After leaving the set for 30 minutes at 25°C ±5°C, rotate the trimmer capacitor to set the clock to 0 second. Proceed the above adjustment with a screwdriver through the external adjusting hole holding the Silver Oxide as illustrated.

Rotating the trimmer capacitor about by ten degrees will produce a time difference of ±0.4 second.

Counterclockwise rotation puts the clock back and clockwise rotation on.

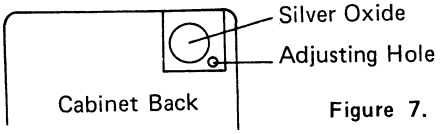



Figure 7.

# 5. ALIGNMENT INSTRUCTIONS

## TEST EQUIPMENTS

1. AM Signal Generator with frequency range of at least from 145 kHz to 23 MHz AM.
2. FM Signal Generator with 10.7 MHz marker signal.
3. FM Sweep Generator with a wide band amplifier of approximately 500 kHz, with 10.7 MHz marker signal.
4. Oscilloscope with a wide band amplifier of approximately 100 kHz.
5. Test loop.– a coil of any size wire with one turn or more. (AM)
6. VTVM.
7. 75 ohm dummy antenna. (FM)

NOTE: When proceeding adjustment with the Radio P.C. Board separating from the Clock P.C. Board, ④ should be connected to ⑤. (See figure 4.)

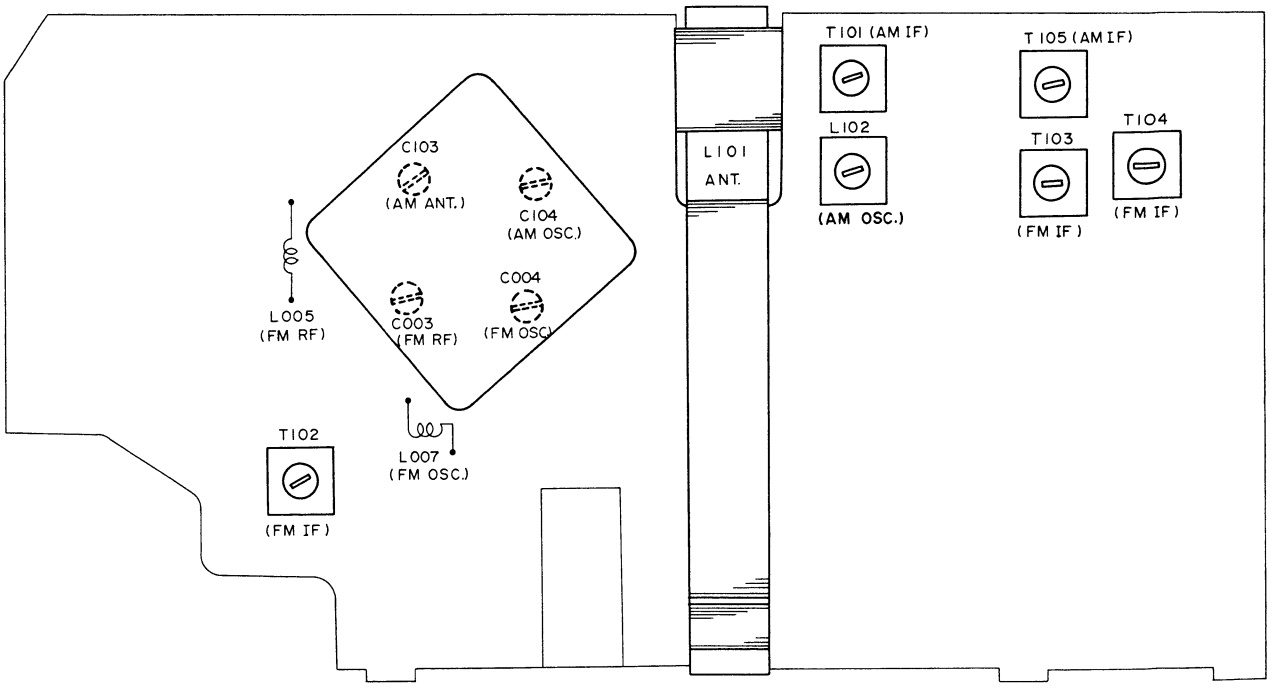



**Figure 8.**

## AM ALIGNMENT

1. Turn on the AM signal generator and the VTVM, and allow a fifteen-minute warm-up period.
2. Using the test loop across the output of the signal generator, inductively connect the signal generator to the radio.
3. Connect the VTVM across the voice coil or an 8 ohm dummy load.
4. Set the band select switch to AM position.
5. Set the signal generator frequency as listed in AM ALIGNMENT CHART and maintain a sufficient output level to provide an indication on VTVM.
6. Set the volume control to mid-position.
7. Proceed as outlined in the AM-IF ALIGNMENT CHART.

## AM ALIGNMENT CHART

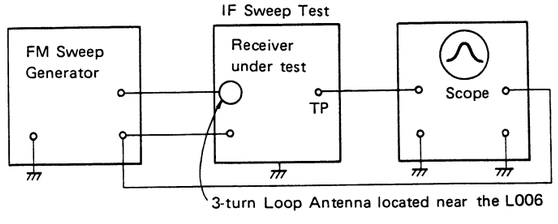
| Band | Step | Signal Generator Frequency | Radio Dial Setting | Adjustment | Remarks |
|---|---|---|---|---|---|
| IF | 1 | 460 kHz | Approximate 1000 kHz | T101, 105 | Adjust for maximum indication |
| AM | 1 | 515 kHz | Tuning Knob Fully Counter-clockwise (Lowest Frequency) | L102 (Osc. Coil) | Adjust for maximum indication |
| | 2 | 1650 kHz | Tuning Knob Fully Clockwise (Highest Frequency) | C104 (Osc. Trim.) | Adjust for maximum indication |
| | 3 | Repeat steps 1 and 2 as required | | | |
| | 4 | 600 kHz | Tune to Signal | L101 (Ant. Coil) | Adjust for maximum indication |
| | 5 | 1400 kHz | Tune to Signal | C103 (Ant. Trim.) | Adjust for maximum indication |
| | 6 | Repeat steps 4 and 5 as required | | | |

## FM-IF ALIGNMENT

1. Set the select switch to FM position.
2. Turn on both sweep generator and oscilloscope, and allow a fifteen-minute warm-up period.
3. Connect the RF SWEEP SIGNAL OUTPUT from the signal generator through the loop antenna to the receiver.
4. Connect the oscilloscope vertical input directly to the test point TUN OUT H and connect the shielded lead to the test point E or chassis ground.
5. Connect the SWEEP VOLTAGE OUTPUT of the sweep generator to the oscilloscope.
6. Proceed as outlined in the FM-IF ALIGNMENT CHART.

## FM-IF ALIGNMENT CHART

| Step | Signal coupling | Equip. | Tuning | Connection | Adjust. point | Pattern |
|---|---|---|---|---|---|---|
| 1 | Connect sweep generator output to a three-turn loop antenna of 10cm diameter. | Sweep generator of 10.7 MHz center freq. with 10.7 MHz marker. | Tuning Pointer middle position | Set scope for connecting output signal from TUN OUT to vertical axis of scope "V" and sweep generator output to horizontal axis "H". | T102, T103, T104, | Turn the core of T104 counterclockwise to obtain a single peak. Adjust the core of T102 and T103 in order until the best single peak is obtained. Finally turn the core of T104 to obtain S curb. |



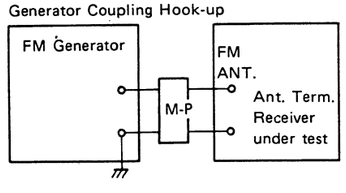




Figure 9.



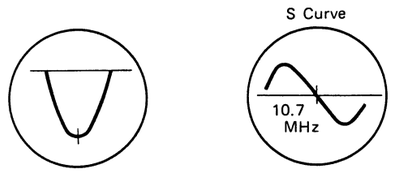



Figure 10.

## FM-RF ALIGNMENT

1. Turn on the signal generator and the VTVM, and allow a fifteen-minute warm-up period.
2. Connect the signal generator output through a 75 ohm dummy antenna across FM ANT.
3. Connect the VTVM across the voice coil or an 8 ohm dummy load.
4. Set the volume control to mid-position.
5. Adjust the signal generator frequency as indicated in FM-RF ALIGNMENT CHART, and maintain a sufficient signal output level to provide a measurable indication.
6. Proceed as outlined in the FM-RF ALIGNMENT CHART.

## FM-RF ALIGNMENT CHART

| Step | Signal Generator | Radio Dial Setting | Adjustment | Remarks |
|---|---|---|---|---|
| 1 | 87.5 MHz | Tuning Knob fully Counterclockwise (Lowest Frequency) | L007 (Osc. Coil) | Adjust for maximum output indication |
| 2 | 109MHz | Tuning Knob fully Clockwise (Highest Frequency) | C004 (Osc. Trim.) | Adjust for maximum output indication |
| 3 | Repeat steps 1 and 2 as required. | | | |
| 4 | 90MHz | Tune to signal | L005 (RF Coil) | Adjust for maximum output indication |
| 5 | 106MHz | | C003 (RF Trim.) | |
| 6 | Repeat steps 4 and 5 as required. | | | |

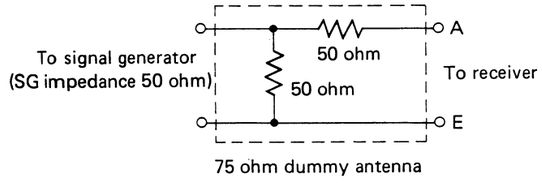



Figure 11.

**CAUTION:**

When realigning the FM Receiving Frequency, the lowest side of the frequency range must not be below 87.5 MHz in order to comply with FTZ regulations in West Germany.

# ELECTRICAL PARTS LOCATIONS

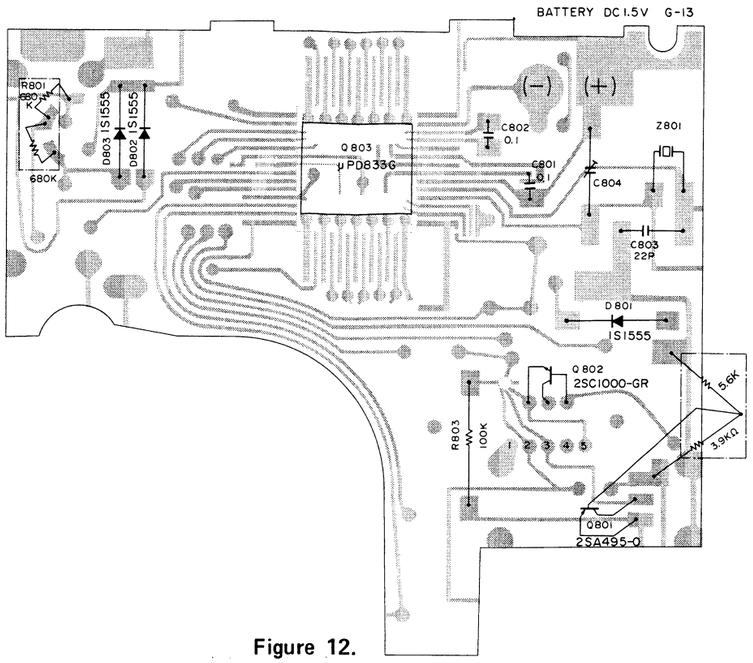



Figure 12.

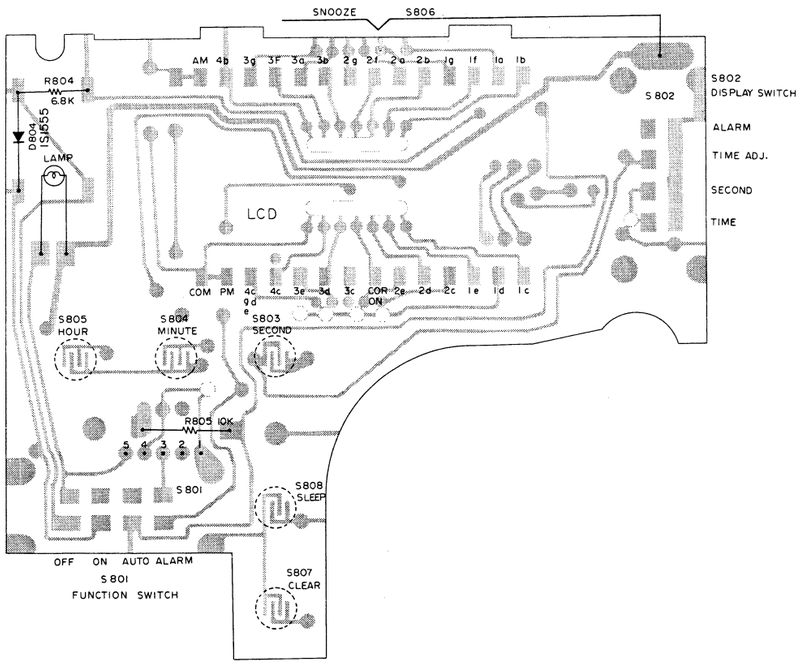



Figure 13.



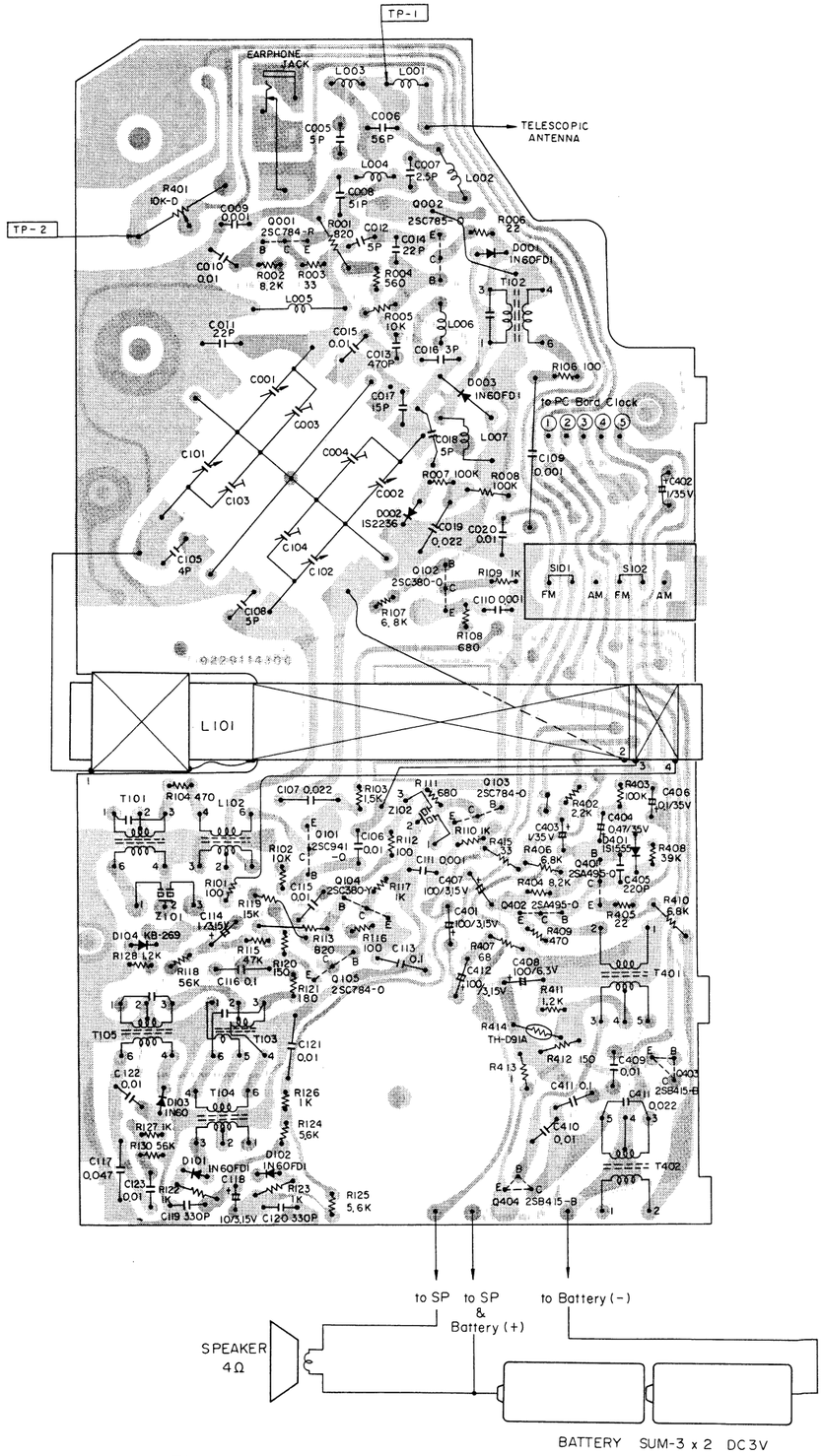
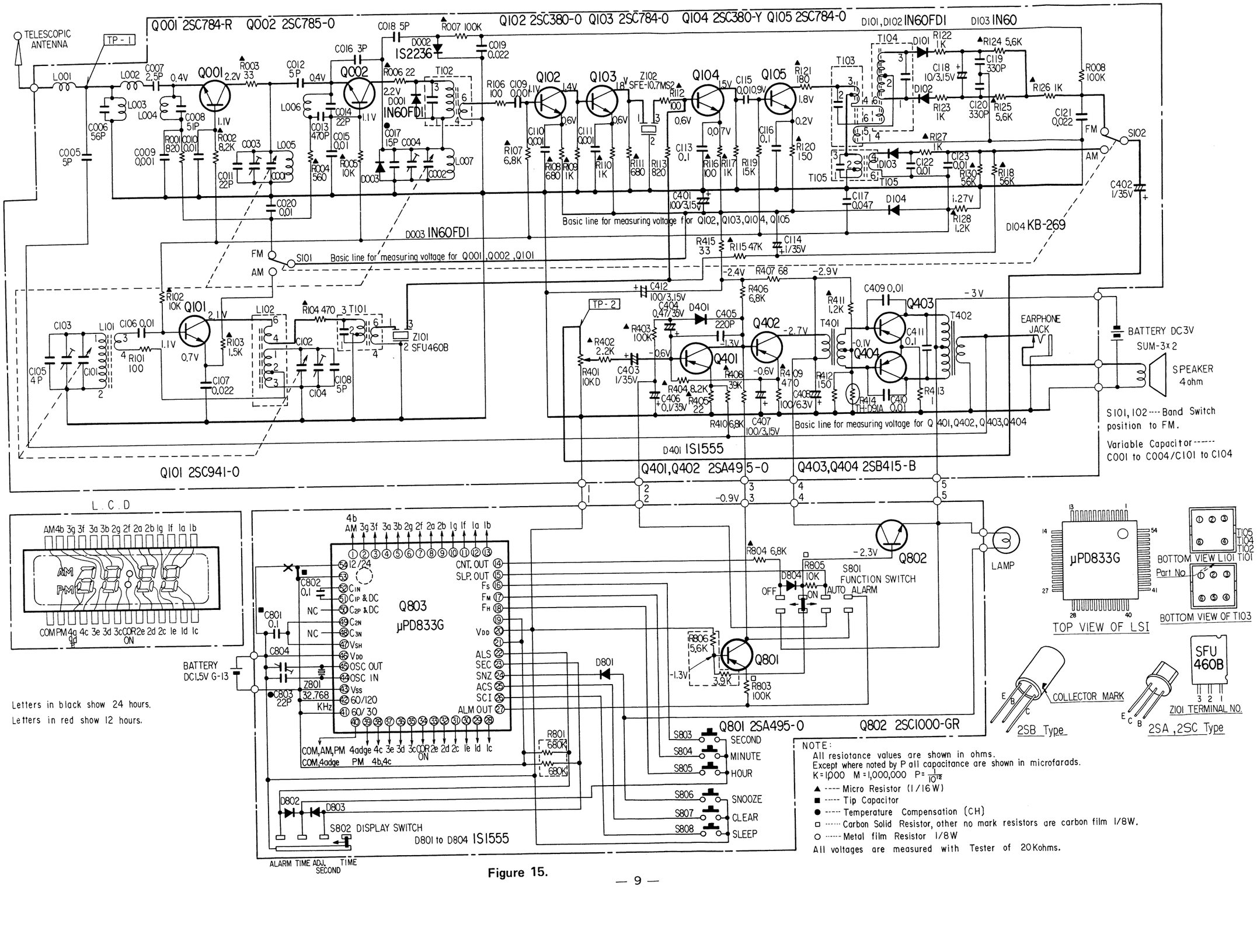



Figure 14.

# SCHEMATIC DIAGRAM




NOTE:
All resiotance values are shown in ohms.
Except where noted by P all capacitance are shown in microfarads.
K=1000 M=1,000,000 P= $\frac{1}{10^{12}}$

- ▲ ---- Micro Resistor (1/16W)
- ■ ----- Tip Capacitor
- ● ----- Temperature Compensation (CH)
- □ ------ Carbon Solid Resistor, other no mark resistors are carbon film 1/8W.
- ○ ------ Metal film Resistor 1/8W

All voltages are measured with Tester of 20Kohms.

**Figure 15.**

## EXPLODED VIEW

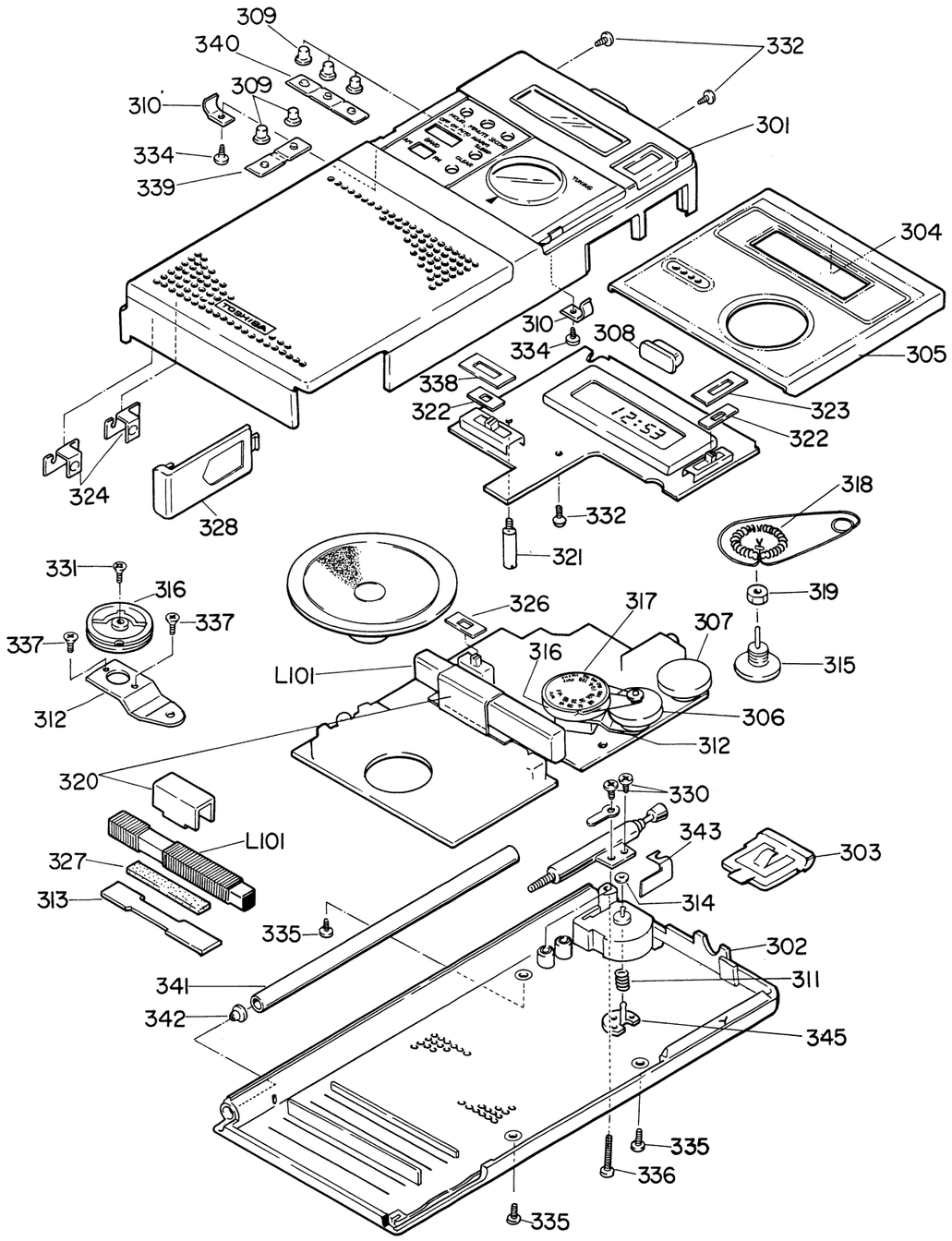



Figure 16.

## PARTS LIST

| Symbol No. | Part No. | Description |
|---|---|---|
| | **TRANSISTORS & DIODES** | |
| Q001 | | Transistor, 2SC784-R |
| Q002 | | Transistor, 2SC785-O |
| Q101 | | Transistor, 2SC941-O |
| Q102 | | Transistor, 2SC380-O |
| Q103, 104, 105 | | Transistor, 2SC784-O |
| Q401, 402 | | Transistor, 2SA495-O |
| Q403, 404 | | Transistor, 2SB415-B |
| D001, 003, 101, 102 | | Diode, 1N60, FD1 |
| D002 | | Diode, 1S2236 |
| D103 | | Diode, 1N60 |
| D104 | 22692017 | Diode, KB-269 |
| D401 | | Diode, 1S1555 |
| | **COILS & TRANSFORMERS** | |
| L002 | 22292112 | Coil, Antenna, FM with Core |
| L003, 004 | 22294230 | Coil, Antenna, FM |
| L005 | 22294362 | Coil, RF, FM |
| L006, 001 | 22292077 | Coil, Antenna, FM |
| L007 | 22294016 | Coil, Oscillator, FM |
| L101 | 22242691 | Coil, Antenna, AM, with Core |
| L102 | 22245236 | Coil, Oscillator, AM, RED |
| T101 | 22264749 | Transformer, IF, IT64749, AM, WHT |
| T102 | 22265766 | Transformer, IF, IT65766, FM, VLT |
| T103 | 22267353 | Transformer, IF, IT67353, FM, RED |
| T104 | 22267354 | Transformer, IF, IT67354, FM, BLU |
| T105 | 22266343 | Transformer, IF, IT66343, AM, BLK |
| T401 | 22214324 | Transformer, Input |
| T402 | 22216307 | Transformer, Output |
| | **ELECTRICAL PARTS** | |
| S101-102 | 22195107 | Switch, Band Change |
| Z101 | 22153083 | Ceramic Filter |
| Z102 | 22153058 | Ceramic Filter, FM, 10.7 MHz |
| W401 | 22151741 | Speaker, SP-05S1E |
| J401 | 22163682 | Jack, Earphone, 3.5ϕ |
| A001 | 22124474 | Telescopic Antenna |
| | 22104453 | Clock Ass'y, 24H |
| | **CAPACITORS** | |
| | **Capacitors are Ceramic 50V unless otherwise noted.** | |
| | **D = ±0.5pF J = ±5% K = ±10% M = ±20% Z = $^{+80}_{-20}$%** | |

| Symbol No. | Part No. | Description |
|---|---|---|
| C001 to 004 C101 to 104 | 22308164 | Poly-variable |
| C005 | 22360360 | 5pF, K |
| C006 | 22360351 | 56pF, K |
| C007 | 22360382 | 2.5pF, K |
| C008 | 22360381 | 51pF, K |
| C009 | 22360366 | 0.001μF, K |
| C010 | 22360344 | 0.01μF, M, 25V, Barrier Layer |
| C011 | 22360356 | 22pF, K |
| C012 | 22360360 | 5pF, K |
| C013 | 22360362 | 470pF, K |
| C014 | 22360356 | 22pF, K |
| C015 | 22360344 | 0.01μF, M, 25V, Barrier Layer |
| C016 | 22360361 | 3pF, K |
| C017 | 22360383 | 15pF, K |
| C018 | 22360360 | 5pF, K |
| C019 | 22360345 | 0.022μF, M, 25V, Barrier Layer |
| C020 | 22306344 | 0.01μF, M, 25V, Barrier Layer |
| C105 | 22306371 | 4pF, K |
| C106 | 22360344 | 0.01μF, M, 25V, Barrier Layer |
| C107 | 22306345 | 0.022μF, M, 25V, Barrier Layer |
| C108 | 22360360 | 5pF, K |
| C109 | 22360366 | 0.001μF, K |
| C110 | 22360366 | 0.001μF, K |
| C111 | 22360366 | 0.001μF, K |
| C113 | 22360347 | 0.1μF, 12V, M, Barrier Layer |
| C114 | 22490011 | 1μF, 35V, Electrolytic, Tantalum |
| C115 | 22360344 | 0.01μF, M, 25V, Barrier Layer |
| C116 | 22360347 | 0.1μF, 12V, M, Barrier Layer |
| C117 | 22360346 | 0.047μF, M, 12V, Barrier Layer |
| C118 | 22490002 | 10μF, 3.15V, Electrolytic, Tantalum |
| C119 | 22360363 | 330pF, K |
| C120 | 22360363 | 330pF, K |
| C121 | 22360345 | 0.022μF, 25V, M, Barrier Layer |
| C122 | 22360344 | 0.01μF, M, 25V, Barrier Layer |
| C123 | 22360344 | 0.01μF, M, 25V, Barrier Layer |
| C401 | 22490005 | 100μF, 3.15V, Electrolytic, Tantalum |
| C402 | 22490011 | 1μF, 35V, Electrolytic, Tantalum |
| C403 | 22490011 | 1μF, 35V, Electrolytic, Tantalum |
| C404 | 22490013 | 0.47μF, 35V, Electrolytic, Tantalum |
| C405 | 22360364 | 220pF, K |
| C406 | 22490012 | 0.1μF, 35V, Electrolytic, Tantalum |
| C407 | 22490005 | 100μF, 3.15V, Electrolytic, Tantalum |
| C408 | 22490008 | 100μF, 6.3V, Electrolytic, Tantalum |
| C409 | 22360344 | 0.01μF, M, 25V, Barrier Layer |
| C410 | 22360344 | 0.01μF, M, 25V, Barrier Layer |
| C411 | 22360347 | 0.1μF, 12V, M, Barrier Layer |

| Symbol No. | Part No. | Description |
|---|---|---|
| C412 | 22490005 | 100μF, 3.15V, Electrolytic, Tantalum |
| | | **RESISTORS** |
| | | **All resistors are Micro Resistor 1/16W ±5% unless otherwise noted.** |
| R001 | 22550180 | 820 ohm, Carbon Film 1/8W |
| R002 | 22570405 | 8.2K ohm |
| R003 | 22570376 | 33 ohm |
| R004 | 22570391 | 560 ohm |
| R005 | 22570406 | 10K ohm |
| R006 | 22570374 | 22 ohm |
| R007 | 22570418 | 100K ohm |
| R008 | 22550204 | 100K ohm, Carbon Film 1/8W |
| R101 | 22540162 | 100 ohm, Carbon Film 1/8W |
| R102 | 22570406 | 10K ohm |
| R103 | 22570396 | 1.5K ohm |
| R104 | 22570390 | 470 ohm |
| R106 | 22570382 | 100 ohm |
| R107 | 22570404 | 6.8K ohm |
| R108 | 22570392 | 680 ohm |
| R109 | 22570394 | 1K ohm |
| R110 | 22570394 | 1K ohm |
| R111 | 22570392 | 680 ohm |
| R112 | 22570382 | 100 ohm |
| R113 | 22550185 | 2.2K ohm, Carbon Film 1/8W |
| R115 | 22570414 | 47K ohm |
| R116 | 22570382 | 100 ohm |
| R117 | 22570394 | 1K ohm |
| R118 | 22570415 | 56K ohm |
| R119 | 22550163 | 33 ohm, Carbon Film 1/8W |
| R120 | 22570388 | 330 ohm |
| R121 | 22570385 | 180 ohm |
| R122 | 22550181 | 1K ohm, Carbon Film 1/8W |
| R123 | 22550181 | 1K ohm, Carbon Film 1/8W |
| R124 | 22570403 | 5.6K ohm |
| R125 | 22570403 | 5.6K ohm |
| R126 | 22570394 | 1K ohm |
| R127 | 22570394 | 1K ohm |
| R128 | 22570395 | 1K ohm |
| R129 | 22570406 | 10K ohm |
| R130 | 22570415 | 56K ohm |
| R131 | 22570406 | 10K ohm |
| R401 | 22613031 | Variable, 12φ, 10K ohm-D, with Switch |
| R402 | 22570398 | 2.2K ohm |
| R403 | 22570418 | 100K ohm |
| R404 | 22570405 | 8.2K ohm |
| R405 | 22570374 | 22 ohm |
| R406 | 22550191 | 6.8K ohm, Carbon Film 1/8W |
| R407 | 22550167 | 68 ohm, Carbon Film 1/8W |
| R408 | 22570413 | 39K ohm |
| R409 | 22570390 | 470 ohm |
| R410 | 22550191 | 6.8K ohm, Carbon Film 1/8W |
| R411 | 22570395 | 1.2K ohm |
| R412 | 22550171 | 150 ohm, Carbon Film 1/8W |
| R413 | 22570431 | 1 ohm, Metal Oxide Film 1/8W |
| R414 | | Thermistor, D91A |
| R415 | 22550185 | 2.2K ohm, Carbon Film 1/8W |
| | | **CABINET PARTS** |
| 301 | 22811080 | Cabinet Front Ass'y |
| 302 | 22832486 | Cabinet Back |
| 303 | 22822131 | Battery Cover Ass'y for Clock |
| 304 | 22902040 | Label |
| 305 | 22842169 | Cover Ass'y, Control |
| 306 | 22824246 | Knob, Tune |
| 307 | 22826212 | Knob, Volume |
| 308 | 22824247 | Button, Snooz |
| 309 | 22824248 | Button, Clock |
| 310 | 22774550 | Plate Spring, Lock |
| 311 | 25772459 | Spring, Battery |
| 312 | 22755107 | Support, Tune |
| 313 | 22758070 | Sheet, Antenna |
| 314 | 22703246 | Hold Washer |
| 315 | 22743224 | Tuning Shaft |
| 316 | 22742202 | Dial Drum |
| 317 | 22847350 | Dial Plate |
| 318 | 25771910 | Spring, Drum |
| 319 | 22702150 | Nut 4¢ |
| 320 | 22757087 | Holder, Antenna |
| 321 | 22753025 | Stud |
| 322 | 22758064 | Cover A, Switch |
| 323 | 22758065 | Cover B, Switch |
| 324 | 22725171 | Battery Contact A |
| 326 | 22758067 | Cover C, Switch |
| 327 | 22751160 | Cushion, Battery |
| 328 | 22822130 | Battery Cover Ass'y |
| 330 | 70432004 | Screw, BID2φ x 4mm |
| 331 | 22707217 | Screw, BID1.7φ x 2.5mm |
| 332 | 22707214 | Screw, BID2φ x 3mm, BLK |
| 333 | 22707216 | Screw, BID2φ x 1.8mm |
| 334 | 22707215 | Screw, BID1.7φ x 1.8mm |
| 335 | 22707261 | Screw, OVL 2φ x 8mm, BLK |
| 336 | 22707262 | Screw, OVL 2φ x 16mm, BLK |
| 337 | 22707257 | Screw, FLT1.7φ x 2mm, BLK |
| 338 | 22758088 | Switch Cover D, Function Switch |
| 339 | 22751146 | Rubber Button, 2 Gang, Electric Conduction |
| 340 | 22751147 | Rubber Button, 3 Gang, Electric Conduction |
| 341 | 22875037 | Bobbin, Antenna, BLK |